A PSILOCERATID AMMONITE FROM THE SUPPOSED TRIASSIC PENARTH GROUP OF AVON, ENGLAND

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ABSTRACT. An ammonite from the Penarth Group (Upper Triassic?) at Chipping Sodbury, Avon, England, is described. This is believed to be the first ammonite to be reported from these beds or from any rocks in Britain currently regarded as Triassic in age. It is small, but its characters are similar to those of Jurassic psiloceratids rather than to those of late Triassic families.

BEDS of the Penarth Group form the overburden to Carboniferous Limestone in large quarries to the north of Chipping Sodbury. Sections were described by Reynolds and Vaughan (1904), Reynolds (1938), and Curtis (1981). Recently, removal of overburden at Hampstead Farm Quarry exposed good temporary sections. The Penarth Group here comprises two units, the Westbury Formation below and the Cotham Member of the Lilstock Formation above, the latter extending to the surface. The section measured was as follows:

(Ground surface)		metres
Cotham Member	Cotham Marble: nodules of algal limestone	
	Buff calcareous mudstone with impersistent thin limestone beds	1·86
Westbury Formation	Impersistent limestone with channelled base, passing into laminated mudstone	0·08–0·35
	Grey and black blocky shales	0·80
	Crystalline limestone, impersistent	0–0·23
	Black, grey mottled, blocky shales	0·55
	Black fissile to blocky shales	0·80
	Black laminated shales	0·40
	Conglomeratic bone bed	0–0·20
Carboniferous Limestone		

The total thickness of the Penarth Group is about 5 m. Thicknesses of individual beds are averages as some are variable.

The uppermost bed of the Westbury Formation has yielded an abundant and varied vertebrate fauna, and invertebrates of several groups including well-preserved ostracods and echinoid spines. The ammonite was found by M.T.C. and S.A.C. in this uppermost bed at ST 726839. It has been deposited in the City of Bristol Museum and Art Gallery with the registration number BRSMG Ce 9715.

MODE OF STUDY

On account of its small size, the ammonite was photographed with a scanning electron microscope using backscattered electrons (Taylor 1986) to avoid the need to give the presently unique specimen a metallic coating. This did not show up the suture lines well and these were drawn under ordinary light with a camera lucida and a low power binocular microscope.

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DESCRIPTION

The fossil is an internal mould in 'limonite' which may replace pyrite, suggesting origin in an anaerobic sediment. The specimen is 3·8 mm in diameter and consists of three and three-quarter whorls (text-fig. 1A, B). It is an evolute form, each whorl overlapping about one-quarter of the preceding one. The umbilicus is about 40% of the diameter. The whorl thickness and whorl height both measure 1·2 mm, so that the whorl section is roughly circular except for the impressed area; due to the small size of the fossil it was not possible to draw the whorl section accurately. The internal mould is smooth showing no ornament. The protoconch, whose visible part is about 80 μm in diameter, is seen on the left side (text-fig. 1C, D). The body-chamber comprises just over half a whorl and is probably complete. Several suture lines are visible including the last (text-fig. 1E). They are asymmetrical, the centre of the median saddle lying to the left of the mid-line of the venter. The saddles are therefore broader on the right side than on the left.

The presence of the body-chamber shows that the fossil is not the nucleus of a larger ammonite. There is no clear indication that the shell is mature; it could be the adult of a very small species, or the young of a larger form.

COMPARISON

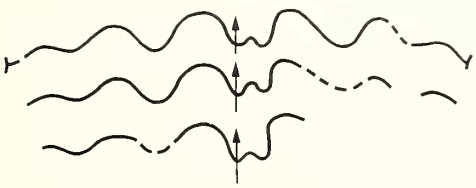
In view of its stratigraphical position, in beds currently classed as late Triassic (Warrington *et al.* 1980), comparisons have been made with latest Triassic and earliest Jurassic ammonites. The term Rhaetian is used here for the latest Trias without prejudice as to whether it should be used for the uppermost stage or substage of the Trias (Wiedmann *et al.* 1979; Tozer 1980, 1981).

The small size of the fossil limits the characters available for identification: these are the suture line, shell form, and shell ornament (or rather lack of it). The suture line is indistinguishable from the early sutures of the Hettangian genus *Psiloceras*, and also from several other early Hettangian genera placed in the Family Psiloceratidae (Schindewolf 1962). The sutures of most Rhaetian ammonites (Wiedmann 1972; Tozer 1979) are not similar: in these the external saddle is typically longer and nearly parallel-sided. Furthermore, members of the Choristoceratidae, the last family to die out in the Alpine Trias, have only two to two-and-a-half saddles in the external suture line, compared to three in the present form. Asymmetry of the suture is common in, though not diagnostic of, the Psiloceratidae, but rare or absent from late Triassic genera.

The Triassic Phylloceratina (*Rhacophyllites*, *Eopsiloceras*), believed ancestral to Psiloceratidae (Tozer 1971; Guex 1987), with smooth, relatively evolute shells, are the Triassic ammonites most nearly similar to the present form. The suture line of *Rhacophyllites* has subdivided lobes and phylloid saddles at a whorl height of about 1 mm, as in the form described as *Phyllytoceras zlambachense* Wiedmann (1972, p. 584, text-fig. 12*b*). The genus *Phyllytoceras* was proposed by Wiedmann (1970) with the type species, *P. intermedium*, believed to be from the Karnian (Triassic) of Iran. Whatever the real identity of the type species, *P. zlambachense* has been reinterpreted as *Rhacophyllites* sp. (Krystyn 1974, p. 142). The suture line of *Eopsiloceras* is not known at a size comparable to that of the new ammonite but, at larger sizes, it is more differentiated than in comparable *Rhacophyllites*, and is therefore probably so on the inner whorls (Leo Krystyn, pers. comm.).

Many ammonites are smooth to diameters greater than 4 mm, so that the absence of shell ornament in the present form is of limited value for comparison. However, in the Choristoceratidae, which include the youngest Rhaetian ammonites, ornament is already present at a diameter of less than 4 mm (Tozer 1979). The straight-shelled member of this family, *Rhabdoceras*, has coiled innermost whorls, but already shows non-planispiral coiling at a size comparable to that of the new form (Tozer 1979; Wiedmann 1972, pl. 1, fig. 5).

A new genus and species *Primapsiloceras primulum* was recognized by Repin (in Polubotko and Repin 1981) from beds said to lie below the Planorbis Zone of north-east Siberia. It is ribbed from a diameter of at least 3 mm and is thus not comparable with the new find. Its suture line at this



TEXT-FIG. 1. Psiloceratid ammonite from the Westbury Beds, Hampstead Farm Quarry, Chipping Sodbury, Avon. Bristol Museum no. Ce 9715. A, B, left and right sides, ×18. C, umbilical region of left side of same specimen, showing protoconch, ×75. D, same, ×225. E, last three suture lines of the specimen shown in A–D, ×30, at whorl height 0·9 mm.

size has not been illustrated. Guex (1987, text-fig. 1) shows it as an early derivative of *Psiloceras* and believes it to be of early Hettangian age (op. cit., p. 459).

We conclude that, when compared with the stratigraphically nearest forms, the specimen is indistinguishable from the inner whorls of *Psiloceras* and is to be placed in Psiloceratidae. On account of its small size we do not assign it to a genus or a species.

Tozer (1971, 1981) proposed that a single ammonite lineage connected late Triassic and earliest Jurassic forms. The only possible Triassic ancestors of this lineage are the Discophyllitidae, which differentiated around the Triassic–Jurassic boundary into Juraphyllitidae + Phylloceratidae, retaining many discophyllitid features, and the Psiloceratidae with, in general, simpler suture lines and more evolute shells (Guex 1987). The present find shows that psiloceratid characters had already appeared in Britain at the horizon represented by the top of the Westbury Formation.

STRATIGRAPHY

The Westbury Formation has long been correlated with the late Triassic 'Rhätische Stufe' of the eastern Alps (in modern terms the Kössener Schichten) on the basis of the bivalve fauna, especially *Rhaetavicula contorta* (Portlock), common to both units. The history of subdivision and correlation at this level has been related by Pearson (1970). Moore (1861, p. 487), writing about southern England, recognized a Rhaetic Formation comprising *Avicula contorta* beds below and White Lias above. In the Geological Society of London's Triassic correlation chart Warrington *et al.* (1980, pp. 18, 54) were cautious, noting that British late Triassic bivalves are principally those of black shale facies and 'of limited use in correlation with the more calcareous sequences of the Standard [i.e. "the Alpine region"]' (p. 18) and again that the macrofossils of the Penarth Group 'though generally indicative of a late Triassic age, do not permit direct correlation with the Standard Sequence' (p. 54). They preferred to abandon the term 'Rhaetic', used in Britain since Moore (1861) wrote, in favour of the term Penarth Group (op. cit., p. 13) of which the Westbury Formation is the lowest component.

The authors of the Triassic correlation chart (Warrington *et al.* 1980, p. 10) adopted 'the first appearance of ammonites of the genus *Psiloceras*' to mark the base of the Planorbis Zone and therefore of the Jurassic System in Britain. This was in agreement with the authors of the Jurassic chart, in which Torrens and Getty (in Cope *et al.* 1980, p. 22) wrote 'there is no evidence in Britain for an earlier ammonite fauna than that with *Psiloceras planorbis* . . .'. At that time (1980) the first known appearance of *Psiloceras* was at an apparently constant horizon a few metres above the base of the Lias, the lithostratigraphic unit above the Penarth beds.

The present find raises two related questions. The first is the correlation of the British sequence with the Alpine. The latter does not show a continuous record of ammonites, the last *Choristoceras marshi* of the Trias being succeeded by a barren gap before the first *Psiloceras* of the Jurassic in the area south of the Wolfgangsee, Austria (L. Krystyn, pers. comm.). The new find may indicate that the top of the Westbury Formation correlates with a higher horizon in the Alpine sequence than had been thought.

The second question concerns the base of the Jurassic System in Britain. As the present find is indistinguishable from *Psiloceras*, it could be claimed that it marks the 'first appearance of . . . *Psiloceras*' and therefore places the base of the Jurassic at the top of the Westbury Formation. We do not do this, but propose discussion of the desirability of defining the base of the Planorbis Zone in a stratotype section, which had not been done when Torrens and Getty wrote (in Cope *et al.* 1980, p. 21) and has not been done since.

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